



TITLE:

# The Preparation of Some New Synthetic Fibers from Polyvinyl Alcohol by Mixed Emulsion Spinning

AUTHOR(S):

Kitamaru, Ryozo; Ochi, Michinobu; Ko, Yong-jun; Tsuji, Waichiro

---

CITATION:

Kitamaru, Ryozo ...[et al]. The Preparation of Some New Synthetic Fibers from Polyvinyl Alcohol by Mixed Emulsion Spinning. Bulletin of the Institute for Chemical Research, Kyoto University 1961, 39(4-5): 329-330

ISSUE DATE:

1961-11-15

URL:

<http://hdl.handle.net/2433/75841>

RIGHT:

**The Graft Polymerization of Vinyl Compound onto  
a Polyvinyl Alcohol Fiber**

Waichiro TSUJI, Ryoza KITAMARU, Terumichi ICHIBA and Yong-jun Ko

*Kogyo Kagaku Zasshi (Journal of the Chemical Society of  
Japan, Industrial Chemistry Section), 63, 1527 (1960)*

Some vinyl compounds such as methylmethacrylate (MMA), styrene, acrylonitrile were graft co-polymerized onto polyvinyl alcohol (PVA) fibers and their heat-treated or formalized ones by  $\text{CO}^{60}$   $\gamma$ -ray irradiation or a chemical method.

A large amount of styrene and MMA could be graft co-polymerized although acrylonitrile could be done only to 20-30 percents as weight increase onto PVA fibers.

These graft polymerization procedures could be performed by several methods without lowering the fiber tensile strength, although it became lower when computed on the basis of the unit cross section of the fiber, because the cross section of the fiber increases with the proceeding of the graft co-polymerization.

It was found that some favorable properties may be imparted to PVA fibers by these treatments.

The thermoplasticity of PVA fibers would be greatly improved by the graft co-polymerization of a vinyl compound such as styrene or MMA from which thermoplastic high molecular weight compounds are produced.

The elastic recovery of PVA fibers may also be improved by them, especially in a low elongation region by heat-drawing after the graft copolymerization.

Some other properties of graft co-polymerized PVA fibers were examined and discussed concerning their practical uses.

**The Preparation of Some New Synthetic Fibers from  
Polyvinyl Alcohol by Mixed Emulsion Spinning**

Ryoza KITAMARU, Michinobu OCHI, Yong-jun Ko and Waichiro TSUJI

*Nihon Kagakusen-i Kenkyusho Koenshu (Reports of the Research  
Institute of Chemical Fibers, Kyoto University), 17, 39 (1960)*

It was found that polyvinyl alcohol (PVA) aqueous solution in which contains a large amount of the emulsion of polyacrylonitrile (PAN), polyvinyl chloride (PVC), polyethylene (PE), polyvinyl acetate (PVAc), polystyrene (PS), *etc.* is spinnable into sodium sulfate saturated aqueous solution almost in the same way as in a pure PVA aqueous solution, if the mixed emulsion solution is stable during the spinning process.

The mixed ratio of these emulsion polymers to PVA could widely be changed from 0 to 1, in special case beyond 3.

Various kinds of a new mixed component fiber which is composed of PVA and PAN, PVC, PE, PVAc, PS, *etc.* are prepared by this emulsion spinning and also

## ABSTRACTS

by the similar after drawing and formalization as in the usual after-treatment of vinylon. The formalization is necessary for fibers to give a high resistance to boiling water. The emulsion polymers are contained in a PVA fiber only in the state of emulsion particle after spinning, but they would be elongated and conglutinated mutually and would form a continuous structure through the drawing process of the fiber at an elevated temperature or in the swelling agent of emulsion polymers.

The micro structure of the fibers and the deformation of the emulsion particles during these processes were observed by a photo- and electron-microscope and examined by X-ray scattering pattern.

Some properties of these new fibers were examined and it was proved that they have a superior tensile strength almost as that of usual vinylon, and have a better elastic recovery than the latter.

It is interesting that various kinds of the mixed component fibers might be prepared by the mixed emulsion spinning even from the other combination of polymers which have no affinity each other.

---

### Spontaneous Extension of High Molecular Substances

Waichiro TSUJI, Ryoza KITAMARU and Ryutoku YOSOMIYA

*Kobunshi Kagaku (Chemistry of High Polymers)*, 18, 205 (1961)

The spontaneous extension of cellulose derivatives has hitherto been studied by some investigators, but a work concerning the similar phenomena in many other high polymer substances has scarcely so far appeared. This paper is concerned with the spontaneous extension of cellulose acetate and many other substances. The change in length of various substances by heating or immersion in swelling agents are measured. It was found that the spontaneous extension takes place under a proper condition in the case of polyethylene, polytrifluoromono-chloroethylene, polyvinylidenechloride, nylon, *etc.*, whereas it scarcely occurs in polyethylene terephthalate, polyvinyl chloride and polyvinyl alcohol. Some considerations on these phenomena were given.